NAME: CLASS PERIOD: DATE:

KINETIC AND POTENTIAL ENERGY

Background Information

Energy can be in one of two states: potential or kinetic. Energy can be transferred from potential to kinetic and between objects.

Potential energy is stored energy—energy ready to go. A lawn mower filled with gasoline, a car on top of a hill, and students waiting to go home from school are all examples of potential energy. Water stored behind a dam at a hydroelectric plant has potential energy.

Most of the energy under our control is in the form of potential energy. Potential energy can be viewed as motion waiting to happen. When the motion is needed, potential energy can be changed into one of the six forms of kinetic energy.

Kinetic energy is energy at work. A lawn mower cutting grass, a car racing down a hill, and students running home from school are examples of kinetic energy. So is the light energy emitted by lamps. Even electrical energy is kinetic energy. Whenever we use energy to do work, it is in the kinetic state.

In this investigation we will explore the effect that the height of a ramp and the mass of an object have on potential energy and kinetic energy.

Problem *(fill in problem):* _____

_____

Hypothesis

As the height of a ramp increases, potential and kinetic energy will _____.

As mass increases, potential and kinetic energy will_____.

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Materials

3 balls (same size, different mass)
meter stick
balance
ramp (a piece of plywood will do)
3 pieces of 4″ x 4″ wood
stop watch

Procedure

1. Weigh each ball on the balance to determine its mass (in grams). Record the mass on the data table.
2. Draw a starting line one inch down from the top of the plywood.
3. Place one block of wood under the end of the plywood to make a ramp. Measure the height of the ramp (in centimeters) and record the height on the data table.
4. Place one of the balls on the starting line.
5. Release the ball and start the stop watch.
6. When the ball has used all its energy, i.e., when it comes to a complete stop, record the time.
7. Measure and record the distance (in meters) that the ball traveled.
8. Repeat steps 4-7 with the other two balls.
9. Place one additional block under the end of the plywood. Measure the new height of the ramp and record it on the data table.
10. Repeat steps 4-7 with each of the three balls.
11. Using the third block of wood, raise the plywood ramp still higher. Measure the new height and record it on the data table.
12. Repeat steps 4-7 with each ball.

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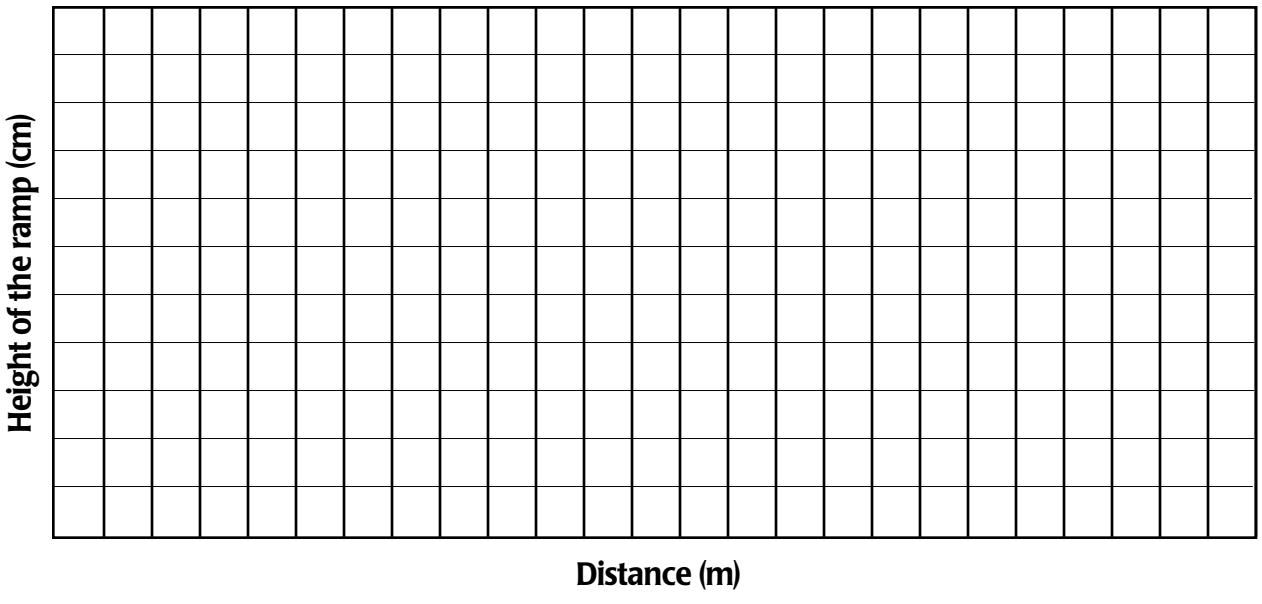
Observations

	Mass (g)	Height of ramp (cm)	Distance (m)	Time (sec)
Ball 1				
Ball 2				
Ball 3				



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Conclusion

1. When in this investigation did each ball have potential energy? _____

   _____

2. When did each ball have kinetic energy? _____

   _____

3. What is the relationship between mass and energy (potential and kinetic)? _____

   _____

4. What is the relationship between height and energy (potential and kinetic)? _____

   _____

5. What evidence do you have that supports your hypothesis?_____

   _____

6. The velocity of an object (V) is calculated by dividing the distance (d) traveled by time (t).

   Using the formula $V = d/t$, calculate the velocity of each ball travelling down the ramp elevated with one block of wood.

   The velocity of ball 1 is _____ ball 2 _____ ball 3 _____

   What is the relationship between the mass of the balls and their velocity? _____

   _____

Application

1. As the mass of the ball and the height of the ramp increased, did the balls speed up or slow down? _____ Why/Why not?_____

   _____

   _____

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2. When a car is going downhill, the driver must apply more pressure on the brakes to stop than if the car were on level ground. Why? _____

_____

_____

3. Why is it harder to stop a four-person bobsled than a three-person bobsled? _____

_____

_____

4. Predict what would happen if you strung a spool on a piece of string and held each end of the string tightly over the bottom end of the ramp, so that the ball barely touched the spool as the ball rolled off the ramp.

_____

_____

_____

5. Predict how the mass of the balls and the height of the ramp would affect the experiment in question #4.

_____

_____

_____

Going Further

1. Kinetic energy (KE) is equal to one-half the product of the mass (m) of a body and the square of its velocity (v), $\mathbf{KE = mv^2/2}$. Calculate the kinetic energy of each ball travelling down the ramp elevated with one block of wood.

   Ball 1 _____ Ball 2 _____ Ball 3 _____